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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
|-----------------|-------------|----------------------|---------------------|------------------|

10/593,265

10/07/2008

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RICHAUD1

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1444 7590 02/15/2011

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EXAMINER

IBRAHIM, MEDINA AHMED

ART UNIT

PAPER NUMBER

1638

MAIL DATE

DELIVERY MODE

02/15/2011

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                       |  |
|------------------------------|--------------------------------------|---------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/593,265 | <b>Applicant(s)</b><br>RICHAUD ET AL. |  |
|                              | <b>Examiner</b><br>Medina A. Ibrahim | <b>Art Unit</b><br>1638               |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 October 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 September 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)         | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

Claims 1-28 are pending and are examined.

#### ***Specification***

The disclosure is objected to because it contains an embedded hyperlink and/or other form of browser-executable code. See, for example, page 2, line 26; page 6, lines 15-16; Applicant is required to delete the embedded hyperlink and/or other form of browser-executable code. See MPEP § 608.01.

#### ***Copending Applications***

Applicants must bring to the attention of the Examiner, or other Office official involved with the examination of a particular application, information within their knowledge as to other copending United States applications, which are "material to patentability" of the application in question. MPEP 2001.06(b). See *Dayco Products Inc. v. Total Containment Inc.*, 66 USPQ2d 1801 (CA FC 2003).

#### ***Sequence Listings***

The sequence listing of 06/23/10 has been entered. However, the sequence does not comply with the sequence Rule of 37 CFR 1.821-1.825 because the sequences on Figure 1 lack sequence identifiers under the Brief Description of Drawings on page 9. Applicant is required to identify the sequences on Figure 1 or to submit a new sequence listing that contains the sequence for Figure 1.

### ***Information Disclosure Statement***

The listing of references in the specification, on pages 31-35, is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

### ***Claim Objections***

At claims 1-4, 7-8, and 17, it is suggested that "Genetically modified plants/cells" be replaced with ---A genetically modified plant--, for proper claim format.

At claims 5-6, "Recombinant vector" lacks an article. It is suggested that "Recombinant vector" be replaced with ---A recombinant vector".

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 6 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 6, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See

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MPEP § 2173.05(d). Appropriate correction is required to clearly define the metes and bounds of the claim.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 13 recites the broad recitation tissues, and the claim also recites "preferably leaves and possibly branches" which is the narrower statement of the range/limitation. Appropriate correction is required to clearly define the metes and bounds of the claim.

Claim 4 is indefinite because it is unclear if the limitations within the bracket are part of the claimed invention.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3, 5-9, 17, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Borremans et al (EP 1 136 558 A1; published 22 March 2000).

Borremans et al teach genetically transformed plants and plant cells comprising nucleotide sequences encoding the bacterial CadA P-type ATPase heavy metal transport protein under the control of a plant promoter in a vector, wherein the transformed plant/plant cells show improved heavy metal tolerance which allow phytoextraction of heavy metals and improved heavy metal accumulation. The cited reference teaches that the P-type Atpase proteins encoding genes, including the ZntA gene shown in Table 1, are preferred for plant transformation to produce transgenic plants with heavy metal tolerance and accumulation activity because P-type ATPase genes provide tolerance to multiple toxic trace elements such as Cu, Cd, Pb, Zn and Ag. Therefore, Borremans et al teach all claim limitations.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3 and 4-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borremans et al (EP 1 136 558 A1; published 22 March 2000) in view of Bernard et al (WO 2004078905 A2; published September 16, 2004) and Chaney et al (US 5, 944, 872).

Borremans et al teach transformation of plants/cells with a vector comprising with one or more genes encoding heterologous P-type ATPases under the control of a plant promoter and genetically transformed plants and plant cells expressing said P-type ATPases having improved heavy metal tolerance which allow phytoextraction of heavy metals and improved heavy metal accumulation as discussed above.

Borremans et al do not explicitly teach the use of a transgenic plants expressing the P-type ATPase of HMA4 for phytoremediation of soils contaminated with heavy

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metals and transgenic plants coexpressing the P-type ATPases and Glutathione synthase, phytochelatin synthase or gamma glutamylcysteine synthetase.

Bernard et al teach tobacco plants transformed with a construct comprising an isolated nucleic acid encoding cadmium/zinc transporting P-type ATPase designated as TcHMA4 and AtHMA4 which confers heavy metal accumulating activity and the use of said transgenic plants for phytoremediation of heavy metal contaminated soils and/or phytoextraction of heavy metals from said soils. The cited reference also teaches that the heavy metals accumulated in the harvestable tissues of the transgenic plants can be extracted for recycling purpose (see paragraphs pages 3-4, 0069, 0087-0088 and the claims). At page 28, Table 1, other genes such as phytochelatin synthase are disclosed which can be used for metal detoxification are disclosed.

Chaney et al teach a method of removing heavy metals including cobalt from contaminated soil using a hyperaccumulating plant species from Alyssum, The method comprising cultivating the plant on the soil; harvesting leaf tissues that accumulated the heavy metals; and recovering the metal by drying and reducing to an ash the harvested leaves (see the whole documents)

Therefore, it would have been obvious to one of ordinary skill in the art to use the method of transforming plants with more than one nucleic acid sequence encoding a heterologous P-type ATPase to produce metal accumulating transgenic plants as taught by Borremans and to modify that method by incorporating other P-type ATPase genes known in the prior art such as the Arabidopsis HMA4 taught by Bernard et al to produce transgenic plants having heavy metal hyperaccumulating activity in order to use them



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for phytoremediation of soils contaminated with heavy metals and/or phytoextraction of metals as suggested by Bernard et al, with a reasonable expectation of success. One would have been motivated to use P-type ATPase genes or different types of P-type ATPase genes to transformed plants, given that the P-type ATPase genes provide tolerance to multiple toxic trace elements such as Cu, Cd, Pb, and Zn. It would also have been obvious to one ordinary skill in the art that the heavy metals accumulated in the harvestable tissues of the metal accumulated plants can be extracted as suggested by Bernard et al using metal extraction methods taught by Chaney et al, without unexpected results. The steps of removing whole plant or plant tissues containing the metal at time intervals or extracting metals in a specific state would have been an optimization of growth parameters. Therefore, the invention as whole was a prima facie obvious.

### ***Remarks***

Claim 4 is free of the prior art.

No claim is allowed.

### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Medina A. Ibrahim whose telephone number is (571)272-0797. The examiner can normally be reached on M-TH 8:00 am to 5:30 PM, and every other Friday from 8:00 AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anne Marie Grunberg can be reached on 571-272-0975. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAI  
2/14/2011

/Medina A Ibrahim/  
Primary Examiner, Art Unit 1638